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WHITE PINE BLISTER RUST SURVEY IN WYOMING, IDAHO, AND UTAH 1967

U.S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
Division of State and Private Forestry
Northern Region

Missoula, Montana

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WHITE PINE BLISTER RUST SURVEY IN WYOMING, IDAHO, AND UTAH 1967

By

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INTRODUCTION

A survey for white pine blister rust, Cronartium ribicola J. C. Fisch. ex. Rabenh., was conducted west of the Continental Divide in Wyoming, Idaho, and Utah in 1967. Results of a similar survey conducted east of the Continental Divide in 1966 have been reported (3). Personnel from the Northern Region and Intermountain Region, U.S. Forest Service; and National Park Service, Midwest Region, participated in this survey.

METHODS AND MATERIALS

Whitebark and limber pine and Ribes species (gooseberry and currant bushes) were examined in the Bridger, Teton, Targhee, Cache, Caribou, and Sawtooth National Forests, and Yellowstone and Grand Teton National Parks. Forest type maps, previous survey data, and personal knowledge were used to select areas for examination.

Stands selected for examination were all within 1 mile of a vehicle road. Sample areas were located 1 mile or more apart and were recorded according to township, range, and section. White pine and ribes were carefully examined for blister rust infections. Stream type ribes within one-half mile of white pine were the preferred host associations in the survey. Ribes were inspected by cutting a number of stems and examining the underside of the leaves for rust lesions. Pine boles and branches were inspected from the ground or by climbing. Trees of all ages were examined. When infections were discovered, the year of infection was determined when possible. When more than 12 infections were found, only the total number and the year of infection for the oldest and youngest cankers were determined. The number of infected trees and ribes stems and total number of trees and ribes stems examined were recorded for each sample area.

Since the two pathogens Cronartium ribicola and C. occidentale share the same ribes host in the Northwest and Pacific Coast regions, the causal organism must be identified. Separate leaf samples were taken from all infected ribes species in the immediate area in order to provide enough material for laboratory analysis. Several reliable procedures for chemically differentiating the telia of C. ribicola and C. occidentale in the laboratory are available (1, 4, 5). The improved methods (5) were used on all samples.

RESULTS AND DISCUSSION

White pine blister rust was discovered for the first time on pine and ribes in parts of the Bridger and Teton National Forests and on ribes in Grand Teton National Park and Targhee National Forest. Data for all areas examined are summarized by State and administrative unit in table 1. The data for western Wyoming, where the survey was most intensive, indicate a relatively low level of the disease. However, almost half of the sample areas had infections on pine or ribes or both. Infection centers having a potential for disease intensification are present, particularly in western Wyoming. The data for each sample area are shown in table 2.

Twenty-five samples of infected ribes leaves from 16 sample areas were analyzed in the laboratory for pathogen identity. Six of these samples, collected from locations with pinyon rust, showed a positive reaction for C. occidentale in the laboratory, and served as controls for the other samples.

One ribes species, Ribes petiolare, collected from six sample areas in western Wyoming, was infected with C. ribicola in all cases. No C. ribicola infection was found on R. petiolare in four sample areas outside of Wyoming.

The known limits of white pine blister rust in the Northwest are shown in figure 1. Six pine and one ribes infection centers were added to the status map issued last in 1967. In addition to the new discoveries by Region 1 survey personnel, infected white pine were reported for the Boise NF in central Idaho (dated 1958) and the Bridger NF in western Wyoming (dated 1962) by Krebill (7). New infections discovered in southern California in 1968 (dated 1961) (6) are also shown on the map.

A careful examination of the map will reveal several areas of white pine type in the Northwest that should be surveyed. Northeastern and central Oregon, central Idaho, and central Montana are three of the more obvious areas in need of clarification.

Six pine and five ribes infection centers were added to the incidence map for Wyoming (fig. 2). The known distribution of the disease in Wyoming was extended along the Salt River Range south of the Snake River Canyon and toward the Continental Divide in the Wind River Range. The pine infections discovered near the Continental Divide may be related to the repeated discoveries of the disease on ribes south of Lander, Wyoming.

Additional comments about the survey for each administrative unit are as follows:

Teton National Forest

The greatest number of sample areas for one administrative unit were examined in this Forest. Infected ribes were found in several places west of the Snake River between Teton Pass and Yellowstone National Park. Eight sample areas ranging from river bottom to timberline locations, east of the Snake River, did not have infected pine or ribes. An infection of probable 1941 origin

representing the oldest known pine infection in the Forest was found on a limber pine near the Hoback Campground along the Hoback River.

Teton National Park

Very little surveying for blister rust has been done in the Park in recent years. The infected ribes found along the trail near the west shore of Jenny Lake represent the first discovery of the disease in the Park since 1956. Other infection centers are probably present in the Park.

Yellowstone National Park

A brief history of the disease in the Park was described in the 1966 survey report. Ribes eradication is now confined to the older units established at Mount Washburn and Mammoth Springs in the northern portions of the Park. A general blister rust distribution survey in the northern portion of the Park in 1968 showed a more widespread occurrence of the disease than was previously known (2). Most of the 1968 survey was confined to stream courses where the disease was more likely to occur. A southern extension of the disease on pine became known when infections were found in 1967 along the Snake River near the southern boundary of the Park.

Targhee National Forest (East division)

Recent blister rust surveys have been concerned primarily with that portion between Yellowstone National Park and the Snake River Canyon.

Infected ribes were found in all of the three areas sampled. Two of these areas were within 8 miles of the southern boundary of Yellowstone National Park, while the third was along the Grand Canyon of the Snake River. Numerous infections on pine near the highway along the Snake River from Alpine junction to the Hoback River junction were found in a previous survey (3). The Snake River Canyon area probably has the greatest potential for a blister rust epidemic of any known infection center south of Yellowstone National Park, making it a very suitable area for the location of rust behavior study plots. The status of the disease in the western division of the Forest is not known.

Bridger National Forest

The discovery by Krebill (7) near Fremont Lake establishes the presence of the disease on pine for the first time in the Wind River Range. The infection centers discovered near Bedford and Salt River Pass south of the Snake River Canyon extend the known limits of the disease approximately 40 miles south near the western boundary of Wyoming (fig. 2). An intensive survey, particularly along the Salt River Range, would give a more complete distribution pattern of the disease in that area.

Sawtooth National Forest

Of the five areas examined during the survey, three of these were near Galena Summit. Infections were not seen on either host in one sample area near Alturas Lake even though the whitebark pine is intermingled with four species of ribes. The disease was found approximately 50 air miles northwest of this area by Krebill (7). Very little surveying has been done in this Forest and other Forests in south-central Idaho, which leaves a sizable area in need of clarification.

Caribou and Cache National Forests

White pine is apparently a minor species in these Forests, occurring primarily as scattered individuals or in open stands, mostly on south-facing slopes. The only place the disease is known to occur in these Forests is in Skinner Canyon near Nounan, Idaho, in the Cache National Forest. Ribes leaves from the same plant in Skinner Canyon were infected with blister rust both in 1965 and 1967. A heavy concentration of Ribes petiolare within one-half mile of these plants was not infected in either 1965 or 1967. Areas such as Skinner Canyon have usually not been included as sample areas because they lack sufficient white pine.

SUMMARY AND DISCUSSION

A total of eight administrative land units in western Wyoming, southeastern Idaho, and northeastern Utah were sampled in 1967 for white pine blister rust. Numerous infections on pine and ribes in many sample areas in western Wyoming indicate the disease is well established there.

New discoveries in the Salt River and Wind River Mountain Ranges extend the known southern limits of the disease in Wyoming. If the past history of rust development in western Wyoming, particularly in Yellowstone National Park, is a reliable indicator, any noticeable damage to the white pine type in western Wyoming is some 20 to 30 years away. The spread and intensification of the disease in most areas examined in Wyoming have been slow.

The disease in the whitebark and limber pine type in the Northern Rocky Mountains is highly variable in its occurrence and damage. In certain limber pine stands on dry, rocky slopes in central Montana, where pine and ribes are in close proximity, the disease is absent and may never be a problem. On the other hand, whitebark pine stands in and near Glacier National Park are 70 to 80 percent infected with multiple cankers per tree. Detection of a disease with such variability is difficult.

The overall distribution of blister rust in the West is in need of clarification. Central Montana, south-central Idaho, and northeastern Oregon need to be surveyed. The surveys conducted by the Northern Region since 1964 have been primarily concerned with the spread and intensification of the disease in Wyoming, Utah, and southern Idaho. The potential spread of the disease into Colorado has been of particular concern. The closest known penetration of the

disease toward Colorado was on ribes in two locations near Laramie, Wyoming. Attempts to rediscover the disease there since then have failed. The pathogen in the original discoveries may have been erroneously identified. It now seems unlikely that the disease is present there. However, the disease may become established in Colorado through entry from Utah or Wyoming by means of long-distance spread. The initial establishment of the disease in western Wyoming, southeastern Idaho, and southern California quite likely occurred by this means.

The discovery of the disease near the extreme southern limits of important sugar pine stands in California during 1968 indicates the disease is continuing to spread. Apparently in the West the disease has not reached its southern limit.

Table 1.--Summary of blister rust incidence survey in Wyoming, Utah, and Idaho, 1967

Administrative unit and location	Sample areas			White pine			Ribes stems		
		Infected[1]			Infected			Infected	
	Examined (No.)	(No.)	(Percent)	Examined (No.)	(No.)	(Percent)	Examined (No.)	(No.)	(Percent)
Wyoming									
Bridger NF	8	2	25.0	261	6	2.3	473	60	12.7
Teton NF	11	3	27.3	313	3	1.0	793	67	8.4
Targhee NF	3	3	100.0	5	0	0.0	221	117	52.9
Yellowstone NP	5	4	80.0	221	5	2.3	255	30	11.8
Grand Teton NP	1	1	100.0	10	0	0.0	105	55	52.4
Idaho									
Cache NF	2	1	50.0	13	0	0.0	398	35	8.8
Caribou NF	1	0	0.0	50	0	0.0	75	0	0.0
Sawtooth NF	5	0	0.0	180	0	0.0	370	0	0.0
Utah									
Cache NF	1	0	0.0	25	0	0.0	30	0	0.0
TOTALS	37	14		1,078	14		2,720	364	
AVERAGES			42.5			0.6			16.3

1/ Area was infected if the disease was found on either host plant.

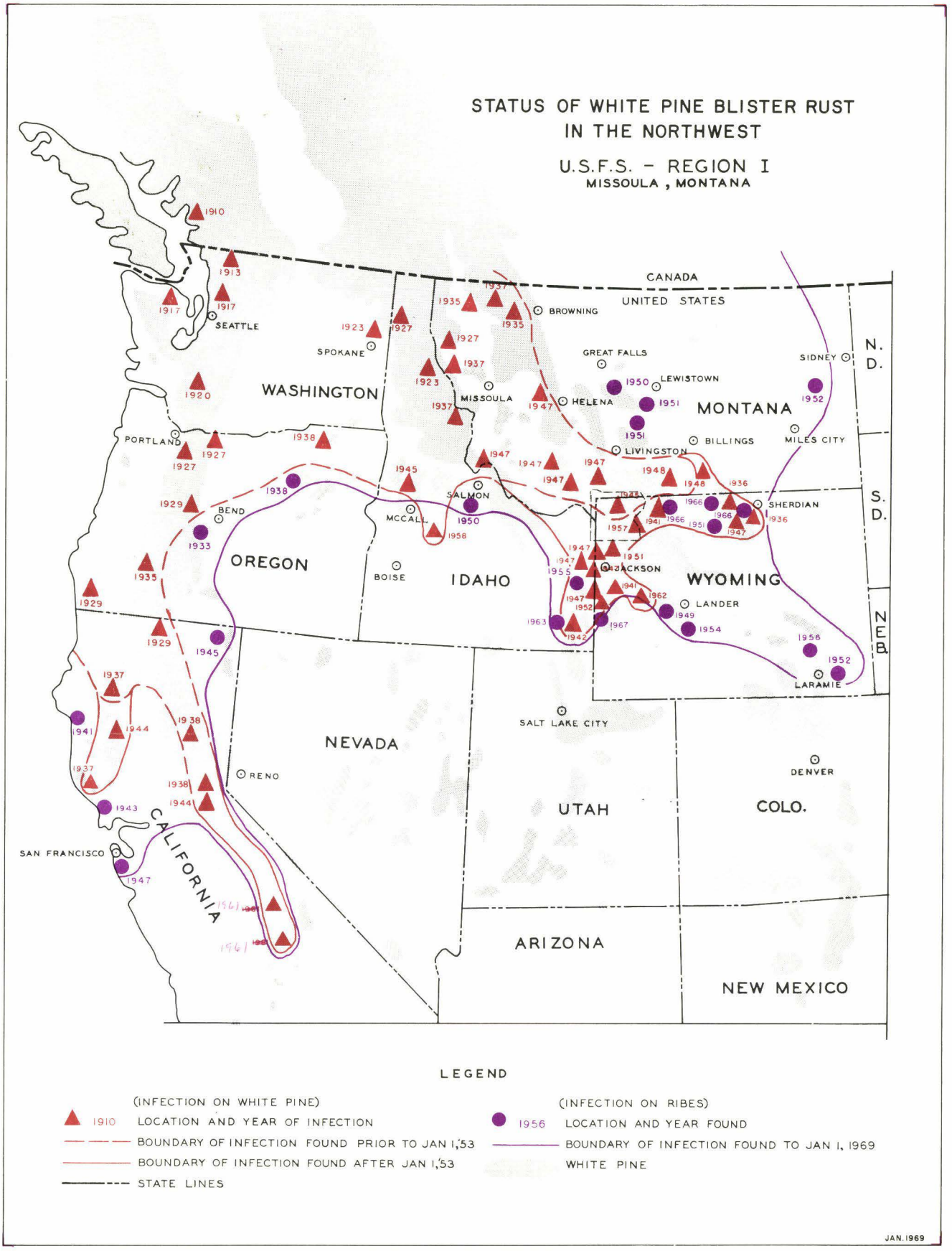
Table 2.--Occurrence of blister rust on white pine and ribes, 1967

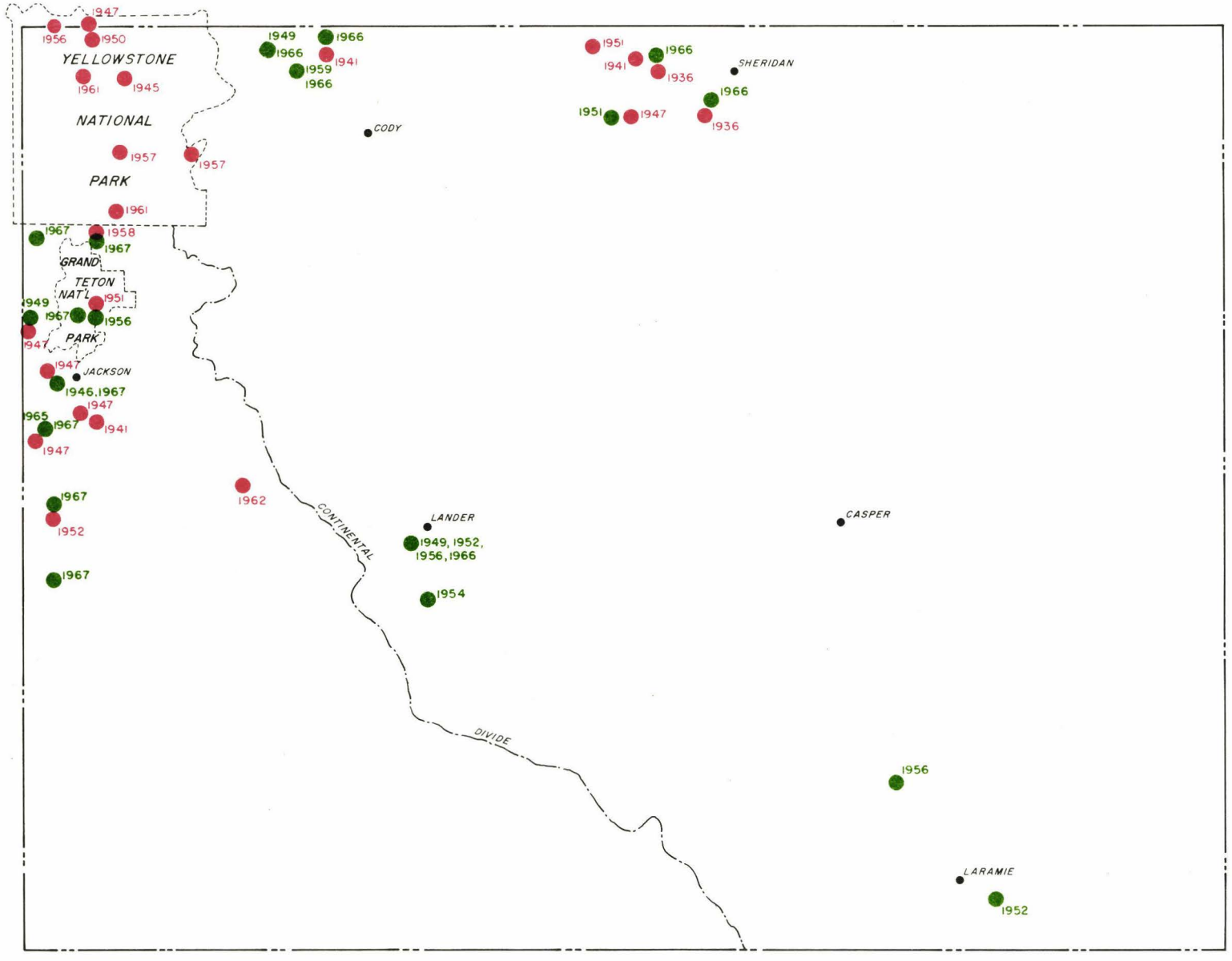
Area	Land unit	Location			White pine		Ribes		Ribes species infected with C. ribicola
		Township	Range	Sec.	Example	Infected	Example	Infected	
					Number				
1	Teton NF	38 N.	112 W.	23	75	0	98	0	
2	Teton NF	41 N.	117 W.	19	0	0	60	12	Petiolare
3	Teton NF	41 N.	118 W.	24	50	0	80	3	Montigenum
4	Teton NF	44 N.	114 W.	3	25	0	12	0	
5	Teton NF	47 N.	115 W.	5	30	3	200	52	Petiolare
6	Teton NF	46 N.	113 W.	29	12	0	62	0	
7	Teton NF	44 N.	111 W.	4	35	0	55	0	
8	Teton NF	44 N.	113 W.	25	0	0	56	0	
9	Teton NF	42 N.	112 W.	14	12	0	60	0	
10	Teton NF	42 N.	112 W.	13	54	0	55	0	
11	Teton NF	38 N.	114 W.	6	20	1	55	0	
12	Targhee NF	48 N.	117 W.	19	0	0	46	26	Petiolare
13	Targhee NF	47 N.	118 W.	1	5	0	110	71	Petiolare, inerme
14	Targhee NF	37 N.	117 W.	4	0	0	65	20	Inerme
15	Bridger NF	28 N.	115 W.	29	20	0	90	0	
16	Bridger NF	28 N.	116 W.	10	0	0	35	0	
17	Bridger NF	30 N.	115 W.	1	50	0	45	0	
18	Bridger NF	30 N.	115 W.	4	90	0	103	0	
19	Bridger NF	32 N.	115 W.	18	10	0	80	0	
20	Bridger NF	40 N.	110 W.	31	75	0	60	0	
21	Bridger NF	34 N.	118 W.	26	6	6	40	30	Petiolare, lacustre
22	Bridger NF	31 N.	118 W.	34	10	0	50	30	Petiolare
23	Cache NF	8 N.	4 E.	3	25	0	30	0	
24	Cache NF	11 S.	42 E.	13	1	0	230	36	Viscosissimum
25	Cache NF	12 S.	42 E.	10	12	0	168	0	
26	Caribou NF	12 S.	45 E.	32	50	0	75	0	
27	Sawtooth NF	8 N.	15 E.	11	9	0	45	0	
28	Sawtooth NF	6 N.	13 E.	2	100	0	135	0	
29	Sawtooth NF	6 N.	15 E.	8	4	0	80	0	

Table 2.--Occurrence of blister rust on white pine and ribes, 1967 (Con.)

Area	Land unit	Location			White pine		Ribes		Ribes species infected with C. ribicola
		Township	Range	Sec.	Example	Infected	Example	Infected	
					Number				
30	Sawtooth NF	6 N.	15 E.	8	55	0	0	0	
31	Sawtooth NF	6 N.	15 E.	4	12	0	110	0	
32	Grand Teton NP	44 N.	116 W.	14	10	0	105	55	Viscosissimum, lacustre
33	Yellowstone NP	49 N.	114 W.	35	70	2	100	0	
34	Yellowstone NP	55 N.	112 W.	7	37	0	90	30	
35	Yellowstone NP	58 N.	115 W.	29	52	1	0	0	
36	Yellowstone NP	56 N.	115 W.	9	15	1	10	0	
37	Yellowstone NP	57 N.	115 W.	35	47	1	55	0	

Figure 1.--


STATUS OF WHITE PINE BLISTER RUST
IN THE NORTHWEST
U.S.F.S. - REGION I
MISSOULA, MONTANA
CANADA
UNITED STATES
WASHINGTON
OREGON
IDAHO
MONTANA
WYOMING
NEVADA
UTAH
COLO.
ARIZONA
NEW MEXICO
CALIFORNIA
N. D.
S. D.
NEB.
SEATTLE
SPOKANE
PORTLAND
BEND
BOISE
MCCALL
SALMON
MISSOULA
BROWNING
GREAT FALLS
HELENA
LEWISTOWN
SIDNEY
BILLINGS
MILES CITY
LIVINGSTON
SHERIDAN
JACKSON
LANDER
LARAMIE
RENO
SALT LAKE CITY
DENVER
SAN FRANCISCO
LEGEND
(INFECTION ON WHITE PINE)
1910 LOCATION AND YEAR OF INFECTION
BOUNDARY OF INFECTION FOUND PRIOR TO JAN 1, '53
BOUNDARY OF INFECTION FOUND AFTER JAN 1, '53
STATE LINES
(INFECTION ON RIBES)
1956 LOCATION AND YEAR FOUND
BOUNDARY OF INFECTION FOUND TO JAN 1, 1969
WHITE PINE
JAN. 1969



LEGEND:

- LOCATION AND ESTIMATED YEAR OF INFECTION ON PINE.
- LOCATION AND YEAR INFECTION WAS FOUND ON RIBES.

INCIDENCE OF WHITE PINE BLISTER RUST IN WYOMING

Figure 2.--

Literature Cited

1. Acree, R. J. and W. H. Goss. 1937. A microchemical colorimetric pH procedure for differentiating the telia of Cronartium ribicola and C. occidentale. J. Agr. Res. 55: 347-352.

2. Berg, M. 1968. Personal communication.

3. Brown, D. H. 1967. White pine blister rust survey in Montana and Wyoming, 1966. Northern Region mimeograph report.

4. Cave, M. S. 1944. Modification of procedure for differentiating the telia of Cronartium ribicola and C. occidentale. Stain Tech. 19: 141-142.

5. Ford, D. H. and T. E. Rawlings. 1956. Improved cytochemical methods for differentiating Cronartium ribicola from Cronartium occidentale on ribes. Phytopath. 46: 667-668.

6. Graham, D. A. 1968. Personal communication.

7. Krebill, R. 1967. Personal communication.

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